

UPGRADE
WORKSHOPUpgrade to twin
graphics cards

Seth Barton explains how to fit a second graphics card to work alongside your existing one – whether you use CrossFire or SLI

HEAT Two graphics cards create a lot of heat. You may need to fit extra cooling fans to your case

GRAPHICS CARD You must buy a second graphics card with the same memory amount and an identical processor to your existing one, which itself must support either SLI or CrossFire



MOTHERBOARD Your motherboard needs two PCI Express x16 slots, and must support either SLI or CrossFire

'FLIP CHIP' CIRCUIT BOARD Some early SLI-compatible motherboards have a module that must be reversed to activate SLI mode

INTRODUCTION

Playing a game is one of the most demanding things you can ask your PC to do. A 3D game such as a first-person shooter gives your processor and memory a good workout, but pushes your graphics card to its limits. As your card ages, it struggles to cope with the latest games played at high resolution and detail settings.

You could buy a new graphics card to replace it, but if your motherboard and existing graphics card support either Nvidia's SLI or ATI's CrossFire system, then you may be able to add a second card to work in tandem with your original.

Buying a second card may be much cheaper than abandoning your existing one and splashing out on a range-topping graphics processor, and it could almost double your frame rate in games. In this *Upgrade Workshop*, we'll show you if this upgrade is suitable for you, what sort of card to buy, and how to install and configure a successful dual-card setup.

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SLI and CrossFire are identical in concept, but are not exactly the same in practice. You can't use either system to partner one ATI graphics card with one Nvidia card, for example. To upgrade, your computer's motherboard must support one of the two systems, and you must have enough room in your case to physically add a second graphics card; see our Compatibility checklist below for details. It's important to realise that even though your motherboard may have two PCI Express x16 slots, it might not necessarily support either system.

Begin by checking your computer or motherboard manual, making sure it explicitly states that it supports either SLI or CrossFire. No motherboard supports both. If you don't have a manual and don't know your motherboard type, download and install the CPU-Z tool from www.cpuid.com. Run the program and select the

Mainboard tab, which should report your motherboard model and manufacturer. Make a note of the reported chipset. Visit the manufacturer's website to see if your motherboard is compatible, and download the manual if it is.

Next, check your existing graphics card supports the same standard as the motherboard. If you have a CrossFire Ready motherboard you won't be able to use your existing card if it's made by Nvidia. Equally, you'll need to replace an ATI card to build an SLI system. If you have Windows XP, click on the Start button and select Run. Type dxdiag into the box that appears and click OK. In Windows Vista, click Start, type dxdiag into the search box and press Return. In the Direct X Diagnostic Tool that appears, view the Display tab and note down your graphics card's manufacturer, model, graphics processor (chipset) and memory amount.

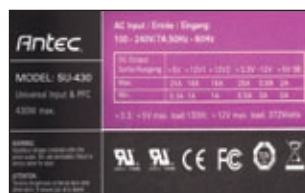
Compatibility checklist



INTERNAL SPACE

Check that you have room in your PC for a second graphics card. Open up the case and then check that the second PCI Express x16 slot, pictured above, isn't obstructed by other hardware or wires. Graphics cards can be up to 270mm long, and those with big heatsinks take up two expansion slots. Check the dimensions of the card you are buying against the available space.

CHECKED



POWER SUPPLY

With the case open, check the specifications on the side of your PSU. We'd recommend at least 400W, but your motherboard's manual and the SLI or CrossFire websites may list exact requirements. Check your PSU has a suitable spare power connector if the card you're buying requires one. You can find more information in our *Upgrade Workshop* article on PSUs, included on this month's cover disc.

CHECKED



WINDOWS VERSIONS

Currently, you can configure SLI only on Windows XP. SLI support hadn't yet been added to Nvidia's Vista drivers as we went to press. If you want to upgrade to SLI under Vista, check Nvidia's SLI website (www.slizone.com) for the latest news and drivers. CrossFire is supported by ATI's Windows XP and Windows Vista drivers. Neither SLI nor CrossFire will work with Windows 95, 98 or Me.

CHECKED



Your graphics card and motherboard must both support SLI or both support CrossFire. If they don't, you'll find it cheaper to buy a single, powerful graphics card to replace the current one.

ATI'S CROSSFIRE

Originally, CrossFire paired a standard ATI graphics card with a CrossFire Edition (or Master) card, with the two cards connected by an external wired connector. Master cards are expensive, however, and replacing your existing card with a single Nvidia GeForce 8800 GTS is likely to prove better value. More recent CrossFire Ready cards, including all those with an X1300, X1600 or X1650 Pro graphics processor, usually don't require a master card or external connector for CrossFire to work. X1650 XT and X1950 Pro cards require a pair of ribbon connectors, which are usually supplied with the cards.

You can choose a second CrossFire card made by any manufacturer, provided its RAM amount and graphics processor match the one you already have. We wouldn't recommend adding a second X1300 card, though, as even two will struggle with the latest games. You'll find out more about CrossFire, including a list of compatible cards, at www.ati.com/crossfire.

NVIDIA'S SLI

All Nvidia cards with a 6600 series or higher graphics processor are SLI compatible, with 6600, 7100 and 7300 series cards generally requiring an extra connector. If your existing graphics card is compatible, you should buy a second SLI card with a matching processor and memory amount. We wouldn't recommend spending more than £150 on a second card, though, as you're likely to get better results by upgrading to a single Nvidia GeForce 8800 GTS for around £200. You can find more about SLI, including a list of certified components, at www.slizone.com.

INSTALLATION

Before starting the upgrade, download the latest drivers for your current graphics card by visiting www.ati.com or www.nvidia.com. For ATI cards, you'll need the full driver version with Catalyst Control Center. If you have Windows XP, Catalyst Control Center requires Microsoft .Net Framework 2.0, which you can download from <http://tinyurl.com/8vgak>. Follow the instructions to install the drivers, then restart your system.



Benchmarking your PC before starting will help you check that the upgrade is a success. Use a freely downloadable program such as 3DMark06, available from www.futuremark.com.

1 INSTALL THE NEW GRAPHICS CARD

Shut down your PC and turn it off at the mains, but don't unplug it. Open the side of your case, referring to the manual if necessary. Touch the exposed metal on the inside of the case to discharge any build-up of static. Locate your free PCI Express x16 slot and the blanking plate that lines up with it at the back of your computer's case. Remove this by unclipping or unscrewing it, keeping any screws safe. If your new graphics card requires two slots, you'll need to remove a second blanking plate.

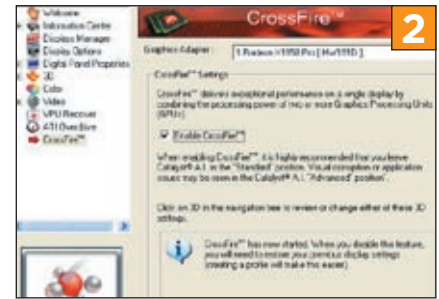
Unpack the new card and, handling it only by the edges, line it up parallel to the free slot. Insert it by pushing it firmly but carefully towards the motherboard, making sure it's correctly engaged in the slot. Once in place, secure it with the screw you removed. If your PC had clip-in blanking plates, look in your motherboard box for spare screws. Once the card is secured, plug in any auxiliary power connector it requires.

Link your cards together if necessary with their extra connector. Most SLI cards use a single link, while CrossFire cards have two. With either system, the connectors fit on to the top edge of the cards, nearer to the end with the video outputs. Check the graphics card manuals for more details.

Some motherboards require you to activate SLI or CrossFire mode manually, either with a physical switch or by enabling a BIOS setting. Check your motherboard manual to confirm whether this is the case. A few SLI motherboards use DIP switches, while on some older SLI motherboards there's a small

EXPERT TIP

Try to ensure that no devices or wiring obstruct the airflow around your graphics cards as they could possibly overheat.



SODIMM card lying flat between the PCI Express x16 slots. The card is double-sided and marked with Normal and SLI modes. If this is present on your motherboard, it is set to Normal. Release the card by pushing the catches at either side outwards, allowing it to pop up. Slide it out gently and turn it around before sliding it back in and clicking it into place. Secure the side back on the PC case and switch it on. Follow the instructions in your motherboard's manual if you need to enter the BIOS to enable dual-card support.

2 ACTIVATE DUAL-GRAPHICS MODE

Allow your computer to boot into Windows. You should see a Found New Hardware pop-up message. As the driver for your graphics card is already on your system, the installation should proceed automatically. Restart your PC and follow the appropriate instructions below.

ATI CROSSFIRE SETUP

When Windows restarts, right-click on the desktop and select ATI Catalyst Control Center. Selecting the Advanced Setup option provides a list of graphics settings. Scroll to the CrossFire option, which should appear near the bottom.

Tick the box to activate CrossFire. Unless you have an early CrossFire Edition card, you can ignore the warning telling you to connect your monitor to the CrossFire card. The screen flicks to black momentarily before an information box appears confirming CrossFire has been activated.

NVIDIA SLI SETUP

When Windows restarts, right-click on the desktop and select Nvidia Control Panel. Select 3D settings and click on Set SLI Configuration. Click the radio button to Enable SLI Technology, and click Yes in the Apply Changes window. Exit the Nvidia Control Panel and restart your PC. When it reboots you should see a pop-up message confirming SLI has been enabled. 

Testing and troubleshooting

With your dual-graphics-card setup working correctly, you'll get faster game performance at the same quality settings. Re-run any benchmarks you used before the upgrade and compare the scores. You may well see an improvement of 50-100 per cent in games but some benchmarks, including 3DMark05, will show only a modest improvement. To be sure your PC is configured correctly and cooled adequately, play a taxing 3D game or leave a benchmark running for at least 30 minutes.

TROUBLESHOOTING

If Catalyst Control Center or Nvidia Control Panel doesn't recognise the second graphics

card, right-click My Computer (Computer in Windows Vista) and select Properties. Choose the Hardware tab and enter the Device Manager (simply select Device Manager in Vista). Click on Display Adaptors and check that there are two graphics cards present. Any entries marked Secondary are not physical cards, but the second video output on a single card.

If the new card isn't shown, try reinstalling the driver. If it still isn't detected, make sure the card is inserted properly in the slot and that any auxiliary power is connected. If both cards show up in Device Manager but you can't activate SLI or CrossFire modes, check that you installed any required connectors between the

cards. If you did, then consult the FAQs and user forums at www.slizone.com or www.ati.com/crossfire.

If your PC crashes, begins to slow down or seems unstable, it may be overheating. If taking the side panel off your case fixes the problem, then try adding another fan to improve the airflow. If this doesn't fix the problem, you need to check that you installed the latest drivers and that you have the latest patches for your software.

If your PC is still unstable, its PSU may be underpowered. Double-check its specifications against the minimum for your system configuration.